ISSN 2222-2944. Інформаційні технології: наука, техніка, технологія, освіта, здоров’я. 2023

THE MODEL OF THERMAL REGIMES OF RADIO EQUIPMENT

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Consider the stochastic problem of heat propagation in a thin finite rod:

$$\begin{cases} \dfrac{\partial U}{\partial t} = a\dfrac{\partial^2 U}{\partial t^2} + f(x,t), \\ U\big|_{t=0} = f_0(x), \\ U\big|_{x=0} = U\big|_{x=t} = 0. \end{cases} \tag{1}$$

where $U-$ is the converted temperature, $t-$time, $a-$ coefficient $f(x)-$ of heat source density.

If $f(x,t)$ has the form $f(x,t) = f_0(x)\xi(t)$, where $\xi(t)-$ is a random process, $M\xi(t)$ and the correlation function $\xi(t)$ is given. Then, representing the solution (1) in the form $U = U_1 + U_2$, where $U_1 -$ the solution is $f(x,t) \equiv 0$, and $f(x,t) \equiv 0$, accordingly with $f_0(x) \equiv 0$, and, using the solution of problem (1), we have (2):

$$K_{U_2}(x,y,t,s) = \int_0^l\int_0^l\int_0^t\int_0^s G(x,x_1,t-\tau_1)G(y,y_1,s-\tau_2)K_{\xi\xi}(\tau_1,\tau_2)\, f_0(x_1)\,\overline{f_0(y_1)}dx_1dy_1d\tau_1d\tau_2,$$

where is the Green's function

$$G(x,y,t-\tau) = \frac{2}{l}\sum_{n=1}^{\infty} e^{-\omega_n^2(t-\tau)}\sin\frac{n\pi x}{l}\sin\frac{n\pi y}{l},\ \omega_n^2 = a\left(\frac{n\pi}{l}\right)^2.$$

If temperature inhomogeneities $f(x,t)$, are localized in space $f_0(x) = f_0\cdot\delta(x-x_0),\quad 0 \le x_0 \le t,$ we obtain:

$$K_{U_2}(x,y,t,s) = f_0\int_0^t\int_0^s G(x,x_1,t-\tau_1)G(y,y_1,s-\tau_2)K_{\xi\xi}(\tau_1,\tau_2)d\tau_1 d\tau_2. \tag{3}$$

$$K_{U_2}(x,y,t,s) = f_0\int_0^{\infty}\Phi(x,t,\tau)\overline{\Phi(y,s,\tau)}d\tau_1,$$

where $\Phi(x,t,\tau) = \int_0^t G(x,x_0,t-\tau_1)\varphi(\tau_1+\tau_2)d\tau_1,\quad \varphi(t) = \sum_{k=1}^{N\le\infty} d_k\Lambda_k(t),$

$$\Lambda_k(t) = \sum_{j=1}^{k} c_{kj}e^{i\lambda_j t},\quad \lambda_k = \alpha_k + i\frac{\beta_k^2}{2}\lambda_i \ne \lambda_j,\quad i \ne j.$$